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EDITORIAL.

Copra Deterioration.

The allied subjects of copra preparation and marketing have received considerable attention from the Department of Agriculture, and have absorbed the full-time services of a research specialist for the last decade.

The main objectives of local copra research investigations were envisaged some ten years ago as consisting primarily of a determination of the characteristics of high-grade copra and of an elucidation of the methods of preparation, suitable both to large and small-scale producers, by which those characteristics could be secured. While it is not claimed that finality has been reached, it may be said that the technique and design of equipment required to produce a high quality of copra under Malayan conditions are now reasonably well understood.

An article in this number discusses the factors responsible for copra deterioration and shows that loss and deterioration are very considerable in the case of half-dried "raw" copra, if delay occurs before it is suitably bulk stored. Some 80 per cent. of Malaya's 613,417 acres of coconuts is owned by small-holders and much of the copra produced on their holdings is of the "raw" type. This unfortunate position apparently is due less to ignorance or apathy on the part of the small-holders than to the fact that under present conditions, with certain exceptions, a high-quality product does not command a premium which compensates the individual producer for the extra care and labour required for its production. In some localities, particularly where only one quality of copra is recognized, the local market is organized to handle an inferior product and to pay for it at a correspondingly low price. In others, the market demands and is prepared to pay for extra quality. To what extent these circumstances will affect the improvement of the standard of Malayan copra in the world market, a standard which has risen in recent years, remains to be seen.

Sir Frank Stockdale's Report.

The September number of this Journal contained a summary of the conclusions reached by Sir Frank Stockdale, K.C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies, as a result of his visit to study Malayan Agriculture. On the conclusion of his visit to Malaya, Sir Frank Stockdale proceeded

to the Netherlands Indies and thence to Ceylon and we publish in this number an abstract of his report on the agriculture of those countries.

The keynote of agriculture in Java is high intensity of cultivation rendered necessary by population density and possible by inherent richness of the soil. Every effort is made to maintain this intense cultivation by close attention to soil conservation and the maintenance of soil fertility, which, coupled with crop improvement *via* the medium of plant breeding, are apparently the keynotes of agriculture in the Netherlands Indies. The research and advisory services concerned have a very impressive record of achievement, and it is also interesting to note the high standard of agricultural education and the facilities which exist for the provision of rural credit. Sir Frank Stockdale concludes that the British Colonial Empire can learn much from the achievements of the Dutch in the Netherlands Indies and considers it apparent that greater attention will have to be given in future to the role of plant breeders in improving tropical agriculture.

In Ceylon, the three major agricultural industries—tea, rubber and coconuts—have each their own separate research and advisory service, a system which leaves the Department of Agriculture free to pay greater attention to the needs of those growing padi and other secondary crops and to the agriculture of the peasant smallholder generally.

The work of the various research institutes and schemes is described and it is considered that they are now firmly established and doing useful work for the industries for which they were created. A number of suggestions are made for desirable future research, and Ceylon is apparently no exception to the general rule that greater attention should be paid to the twin problems of soil conservation and the maintenance of soil fertility. The work of the Department of Agriculture has been largely educational, and it is interesting to note the progress which has been made along the lines of fruit cultivation, animal and poultry husbandry, soil conservation, agricultural marketing and co-operation. Sir Frank Stockdale feels that while much remains to be done, it is very encouraging to see the developments in agricultural research and the considerable efforts that have been made in Ceylon by means of advisory services, propaganda and education to translate the results of such research into that island's agricultural practice.

Original Articles.

COPRA DETERIORATION DURING STORAGE AND SHIPMENT

BY

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Introduction.

Copra is a perishable commodity. The amount of deterioration and loss of actual copra which can occur varies in different circumstances. Commencing with a given quantity of fresh coconut meat, the ultimate quality and the quantity of copra received at the mill depend on four factors:—

(*a*) Care exercised in the preparation of the product.
(*b*) Moisture content of the freshly prepared copra.
(*c*) Treatment during bulking, storage and transport.
(*d*) Length of time elapsing between production and milling.

Period of Storage.

The time elapsing between production and milling is dependent on locality of production, difficulties of collection and local transport, seasonal variation in crop, freight charge fluctuations, amount of cargo space available in ocean-going steamers, and the state of the copra market.

In the case of Straits copra, when shipments keep pace with purchases, the normal interval is just over 2 months, but, in exceptional circumstances, the copra may be held in store for 2 or 3 months prior to shipment. Thus for example, during the Great War it was impossible, on occasions, to obtain cargo space from certain ports and, more recently, a long period of low prices resulted in considerably reduced shipments. When such situations arise, stocks accumulate in the warehouses, and small dealers, and even producers, may be forced to hold up their copra.

Table I provides a rough detailed estimate of the time taken to pass copra from the small-holder in this country to the miller in Europe.

Some of the operations shown therein may be omitted or all may be included in full, so that small-holders' copra which is exported may take from one to seven months to reach the oil mill.

Estate copra is nowadays generally exported from the estate direct to Europe on a through bill of lading and little more than a month need elapse between production and milling.

Copra milled locally is seldom kept for more than a month after production.

Copra Trading.

In the case of the small producer, a small quantity of "raw," half-cured or somewhat under-dried loose copra may perhaps be kept for as long as a week before

Table I.

Approximate Times for Various Operations which may occur between Producing and Milling Small-holders' Copra.

Operation	Time
	days
House storage	1 to 7
Shophouse storage	0 to 7
Local dealers' stores	0 to 7
Road, river or coastal transport	1 to 4
Warehousing at export centre	0 to 150
Ocean shipment	30 to 40
Bulk storage before milling	3 to 14
Total	35 to 229

the collector calls or delivery is arranged. Whenever possible the copra is sold without delay. These small parcels of copra are bulked by a succession of buyers—the shop-keeper, the transporter, the small local dealer, and ultimately the export dealer and shipper—into consignments of gradually increasing size.

Since he usually buys his copra at a flat rate from producers and then may sell it on a dry-weight basis to the merchants, the local dealer will usually lay the wettest copra out in the sun for further redrying, particularly when it is likely to pay him to delay resale. Conversely, when copra is sold at a flat rate, cases have occurred where the lowest grades of copra have been deliberately moistened by the seller to increase the weight.

The bulked copra which ultimately arrives at the export centres, Singapore, Penang and Port Swettenham, from the different production centres is variously dry and exhibits different features and degrees of deterioration depending on the treatment accorded to the product and the effect of weather conditions on production, storage and shipment. It is for this reason that it is described as "mixed" copra, *i.e.*, a mixture of f.m.s. and f.m. copra*; the geographical origin is added to this description, *e.g.* Kelantan "mixed" copra, and this serves to identify the quality, since each coconut district has its particular standard of quality, or a recognized f.m.s./f.m. ratio for "mixed" copra.

* The terms f.m.s. and f.m. are expressions of quality and denote respectively "fair merchantable sundried" and "fair merchantable", the latter being the inferior quality.

The small-holders' bulked copra now being received from most districts is reasonably dry and of high quality and the "ratio" for copra from these districts has distinctly improved; nevertheless some of the copra coming generally from the more remote regions still continues to be of inferior quality. In exceptional cases, such copra is wholly f.m. quality and is offered in a "raw" condition.

Conditioning of Copra by Storage.

"Raw" or half cured copra, if produced near the export centres, is usually received at the export warehouses in a fresh condition but that from the more distant and inaccessible regions or from those places where collection is difficult, is more often badly deteriorated, except when the local dealers or shippers have redried the product before sending it to the export centres.

Fresh "raw" copra, as received, is warm, has a pale yellow gummy surface, is free from mould, and exudes a not unpleasant yeasty odour. Deteriorated "raw" copra is hot, black, soft, matted and glutinous, insect-ridden and dirty; it is covered with a thick layer of wet slime and black mould and has a revolting sour smell.

All bags of "raw" copra are usually emptied without delay, and the contents built up into a huge stack.

Continuous records show an initial rise in temperature inside such a stack from 35° to 52°C. in about 3 hours. Subsequently the temperature declines slowly to about 38°C. on the eighth day of storage and after that even more gradually to about 30°C. in about three weeks, by which time the moisture content has been reduced to between 4 and 5 per cent. During this period the temperature of the stack rises each night when the warehouse doors are closed.

The condition of fresh "raw" copra which has been expeditiously reconditioned may be surprisingly good in spite of previous superficial development of bacterial slimes. In one instance, although a sample of such copra after reconditioning had a dirty greyish-yellow appearance, it shewed little internal discoloration while only 4 per cent. of the pieces were deeply corroded and there were only 8 per cent. of "smalls." The copra had a not unpleasant smell and the acidity of the contained oil was only 0.8 per cent., calculated in terms of lauric acid.

"Raw" copra which has been permitted to deteriorate seriously before warehousing cannot be satisfactorily reconditioned. After warehousing, the whole of the copra is internally discoloured, the range of colour being light-brown to black. The bulk of the pieces are very deeply corroded and all are in process of breaking down into small fragments. There is a very high percentage of "smalls," foreign matter and dust, and the acidity of the contained oil, calculated as lauric acid, is usually in excess of 5 per cent. Such copra is therefore below Straits f.m. quality and requires to be "brightened" with copra of somewhat better quality before shipment.

Irrespective of their condition, the various consignments of "mixed" copra received at the warehouses are usually all made up into large stacks of loose or bagged copra as described above. In this way, copra is self-dried by its own heat of decomposition,* the contained moisture being reduced from anything between 7 and 25 per cent. to between 4 and 7 per cent. according to season. A relatively stable and reliable product is thus obtained which may be sorted, blended and graded for export. The length of storage required depends principally on the moisture content of the copra on receipt, but occasionally self-drying may be curtailed to make up a consignment, when copra is short. Dry copra requires about a week's storage, fairly dry copra about 14 days, and very wet copra as much as three weeks before it is ready for shipment.

Blending and Bulking for Shipment.

Copra is exported in two grades, Straits f.m.s. and Straits f.m. After warehouse drying, the various lots of "mixed" copra are either up-graded by the removal of defective pieces or down-graded by the removal of good pieces, whichever is necessary to produce the required grade. Occasionally there is no picking over, since a parcel may be used to brighten up or bring down a consignment of bulked copra to the desired standard. The method of bulking is to build up, layer upon layer, the various parcels of copra from different sources, so that blending and mixing takes place when this stack of loose copra is broken up and the copra shovelled into sacks. The copra then remains in bags until shipment can be arranged.

During ocean shipment a certain amount of self-heating again occurs in the copra, which is subjected to considerable pressure and disturbance due to the movement of the ship. The individual bags of copra enter the ships' holds at about air temperature (28°C); subsequently there is a slow daily rise for three days to about 35°C. or more according to the efficiency of ventilation in the holds and the condition of the copra; ultimately when more temperate regions are reached the temperature gradually declines.

The merchant shipper who prepares the copra for export takes full responsibility for the ultimate quality of the copra on arrival and for any serious loss in weight in transit.

The foregoing remarks do not usually apply to estate copra which is nowadays mostly of uniformly good quality and can, in consequence, be shipped direct from the estate to Europe without any warehousing, inspection, or blending being necessary. Such copra is classified as Straits f.m.s., although for copra to be forwarded without inspection or warehousing it has, of necessity, to be above normal quality to avoid the possibility of subsequent disputes and arbitration. It is obvious that the interval between production and milling will be much reduced with direct shipment and the amount of handling will also be considerably less. For these reasons, copra of this type usually obtains a small premium.

* For discussion on heat of decomposition see Special Bulletin No. 28, General Series, Department of Agriculture, S.S. & F.M.S. Copra Deterioration, pp. 20 to 22.

The agents of deterioration during transport and storage are yeasts, bacteria, various moulds and insects, and the heat of decomposition, but it is the moisture present in the copra which makes deterioration possible and determines which (if any) of the agents may operate and the extent of the deterioration and loss which occurs.

The individual effects of these several agents cannot be separately determined, as it is not practicable to restrict deterioration to a single factor. Nevertheless it is possible to determine, by experiment, the total deterioration and loss which may be expected to occur with a given set of conditions. Even then it is still not possible to follow normal trading, transport, storage and blending practice since copra under observation has to be periodically sampled and cannot therefore be mixed with other copra.

Storage Trials.

In order to ascertain the extent of the loss which occurs when different types of copra are kept for long periods under normal conditions of storage, two storage trials have been carried out with the six different types of copra shown in Table II. These may be regarded as representative of the different types of copra produced in Malaya. The majority of estates nowadays produce copra corresponding to grade W1, while the best small-holder producers offer grades W1 and W2. Nevertheless copra of grade W3 does still continue to be made in one or two inaccessible regions and this degenerates, according to the absence of care in production or to the treatment accorded to it by the local dealer, to yield copra corresponding to grades R1, R2, and R3.

Table II.

Types of Copra used in Storage Trials.

Lot	Initial Condition	Moisture Content
		per cent.
W 1	Dry smooth white copra	About 8
W 2	Fairly dry white copra	9 to 12
W 3	Half-dried "raw" white copra	About 20
R 1	Dry unscorched "red" copra	About 8
R 2	Fairly dry "red" copra	9 to 12
R 3	Half-dried "raw red" copra	About 20

The various lots described in Table II were each prepared from 100 nuts collected from the same estate. The "red" copra was produced by allowing bacterial decomposition to be initiated prior to drying and to continue to develop subsequently through deliberate carelessness during drying. All the copra was carefully kiln-dried over open smokeless fires.

Two methods of storage were used, the period of storage being 2 months in each case. In one, Trial A, the six lots of copra were sent immediately after manufacture for bulk storage in a Singapore warehouse with copra of corresponding qualities (continuous warm storage). In the other, Trial B, there was an initial period of 14 days during which the six lots of copra were kept in a cool place as individual isolated bags (cool storage). Subsequently this copra was warehoused as in the first trial.

It was not possible in either of these trials to simulate exactly the handling and movement, and the conditions of temperature and pressure to which copra is normally subjected during local trading, warehousing and ocean shipment. The conditions of the first trial may nevertheless be considered roughly to correspond to the treatment accorded to the copra from large producers, while those of the second trial are meant to simulate the treatment accorded to the copra made by small producers, amounting to about two-thirds of the total copra produced in Malaya.

The various lots of copra were each examined, weighed and sampled before, during, and after storage. These samples were analysed for moisture, and the acidity of the contained oil was also determined. At the conclusion of the period of storage, the amount of "smalls" and dust associated with each lot, which in practice is reckoned as copra, was also ascertained and the copra was examined qualitatively by a Singapore merchant.

Thus it was possible to estimate the true loss of copra which occurs during storage and to measure the amount of deterioration under the various conditions stated.

The comparative results of the two trials are shown in Tables III to IX inclusive.

Table III.

Total Loss in Weight during Storage.

(Weights correct to nearest ¼ lb.)

Lot	Trial A Continuous Warm Storage			Trial B Cool and Warm Storage		
	Original Weight	Loss in Weight	Loss	Original Weight	Loss in Weight	Loss
	lbs.	lbs.	per cent.	lbs.	lbs.	per cent.
W1 ...	63.75	1.50	2.3	56.25	3.25	5.8
W2 ...	68.75	5.50	8.0	64.25	6.00	9.3
W3 ...	78.75	18.75	23.8	79.75	20.50	25.7
R1 ...	60.50	3.25	5.3	58.50	3.25	5.6
R2 ...	67.50	6.00	8.9	64.25	10.00	15.6
R3 ...	78.50	17.00	21.6	74.50	20.25	27.2

The total loss in weight in storage includes not only loss of free moisture, but also loss of actual dry copra through decomposition. The loss is expressed as a percentage of the original weight of copra, including contained moisture. It is to be noted that in the transportation of "raw" copra (W3 and R3) about a fifth by weight of the consignment consists of avoidable moisture, thus increasing freight costs.

The final moisture content of the copra after warehouse drying was between 4 and 5 per cent. in all cases.

Table IV.

Loss of Actual Copra during Preparation and Storage.

(Weights correct to nearest ¼ lb.)

Lot	Trial A Continuous Warm Storage				Trial B Cool and Warm Storage				
	Original Dry Weight*	Preparation Loss	Storage Loss	Total Loss	Original Dry Weight*	Preparation Loss	Cool Storage	Warm Storage	Total Loss
	lbs.	lbs.	lbs.	per cent.	lbs.	lbs.	lbs.	lbs.	per cent.
W1	59.25	N	N	N	52.00	N	0.50	1.50	3.8
W2	61.75	N	1.75	2.8	56.50	N	N	1.50	2.6
W3	63.25	N	6.00	9.5	65.00	N	6.75	2.25	13.9
R1	55.25	1.50	0.25	3.2	55.25	1.50	2.00	1.00	8.1
R2	59.25	1.50	0.25	3.0	58.25	1.50	5.25	1.25	13.7
R3	61.25	1.50	2.50	6.5	58.50	1.50	5.25	2.00	15.0

(N = nil or negligible)

* The figures in these two columns were determined by converting the actual weight of each lot according to its moisture content.

It is perhaps surprising that lot W3 ("raw" white copra) of Trial A showed a greater loss than lot R3 ("raw red" copra) of the same trial. It was also more rank and infested by insects. This is doubtless because smoke adheres readily to the surface of slimy "red" copra and this film of smoke serves to provide a temporary check to insect attack and bacterial deterioration during the short period before warehouse-drying. Where there is prolonged cool storage before warehousing, as in Trial B, the agents of deterioration are able to operate freely once the protective smoky film has been broken down and penetrated.

The high spoilage for lots W3 and R3 of Trial B is not exceptional. Such extensive deterioration and breakdown can and do occur in practice.

In the extreme, with abnormally prolonged storage of deteriorated "raw" copra, maintained continuously in a wet condition, it is even possible for the loss to be in the neighbourhood of 99 per cent. since long sustained insect attack and progressive decay due to moisture produced during decomposition may leave only fragments of brown testa, or skin.

Attention is next drawn in Table V to the high production of "smalls" resulting from the storage of "raw" copra in Trial B. Individual pieces of copra were so deeply corroded as a result of deterioration during the period of cool storage that they readily broke down when pressure was applied to the copra or if the copra was disturbed.

Table V.

Reduction of Copra to "Smalls" and "Dust".

Lot	Trial A Continuous Warm Storage				Trial B Cool and Warm Storage			
	Original Dry Weight	"Smalls"	"Dust"	Percentage Spoilage	Original Dry Weight	"Smalls"	"Dust"	Percentage Spoilage
	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	
W1 ...	59.25	N	N	N	52.00	0.75	N	1.4
W2 ...	61.75	0.25	N	0.4	56.50	0.75	0.25	1.8
W3 ...	63.25	0.75	0.25	1.6	65.00	10.25	0.75	16.9
R1 ...	55.25	N	N	N	55.25	1.00	N	1.8
R2 ...	59.25	N	N	N	58.25	0.50	0.25	1.3
R3 ...	61.25	0.75	0.25	1.6	58.50	11.75	0.75	21.3

In Malaya any "smalls" and "dust" are included and sold as copra, but their presence in any quantity is a serious matter to the miller. Seriously deteriorated copra will suffer further size reduction during shipment and transport to the oil mills, so that a larger surface is exposed to the agents of deterioration and losses of small pieces and dust will occur when the material is transported loose in conveyors.

It is to be observed from Table VI that the development of acidity is not serious during the period of cool storage when the loss of copra is greatest (W3, R1, R2 and R3 of Trial B). Samples W3 in both trials had a revoltingly sour smell.

Table VI.

Acidity of Oil in Stored Copra.

(Calculated as lauric acid)

Lot	Trial A	Trial B	
	After 2 months Warm Storage	After Cool Storage only	After Cool and Warm Storage
	per cent.	per cent.	per cent.
W 1 ...	0.17	0.11	0.30
W 2 ...	0.22	0.16	0.32
W 3 ...	2.61	0.81	3.11
R 1 ...	0.25	0.17	0.47
R 2 ...	0.58	0.15	0.39
R 3 ...	2.20	0.40	6.12

Table VII gives the average depth of discoloration in the stored samples of copra. Actually the extent of deterioration varied considerably from piece to piece. Some pieces showed only localized deterioration whereas in others discoloration was complete.

Table VII.

Average Extent of Discoloration in Copra on Storage.

Lot	Trial A	Trial B
W 1	All white	One-third
W 2	One-third	One-half
W 3	Three-quarters	Total
R 1	One-sixth	One-third
R 2	One-quarter	One-half
R 3	Three-quarters	Total

The six lots of stored copra were inspected by a leading exporter and the result of this examination is given in Table VIII. It will be seen that the various lots were classified with respect to the export grades Straits f.m.s. and Straits f.m. as is the case with all copra after it has been stored and when it is ready for blending.

Table VIII.

Effect of Storage on Quality of Copra.

Lot	Quality of Copra after Storage	
	Trial A Continuous Warm Storage	Trial B Cool and Warm Storage
W 1	Straits f.m.s. ++	Straits f.m.s.
W 2	„ f.m.s. +	„ f.m.s.
W 3	„ f.m. +	„ f.m. —
R 1	Straits f.m.s.	Straits f.m. ++
R 2	„ f.m. +	„ f.m. +
R 3	„ f.m.	„ f.m. —

The ratings above and below the recognized export standards indicate to what extent each parcel needed to be blended with inferior or superior copra before export. Two plus and one plus mean "well above" and "above" respectively while a minus indicates that a consignment is below the export standard for the specified quality. It will be noted that with only one exception, *viz.* lot R2, each lot from Trial A is superior to the corresponding lot from Trial B.

Sub-grade copra, *i.e.* f.m.— can easily be recognized when the copra is purchased from the dealer and so can be and is usually penalized, but parcels of copra which may ultimately prove to be superior to the two recognized export grades receive no special premium above the recognized quotation although they have an added value when the various parcels are being blended for shipment.

Finally, Table IX gives the comparative values of the various types of copra derived from the same theoretical amounts of fresh coconut meat. The necessary calculations were based on the losses of actual copra as scheduled in Table IV, the ultimate quality of the material (whether f.m.s., f.m., or sub-grade), and the following prices of copra per picul:—

	per picul.
	$
Estate copra, shipped direct	3.40
Straits f.m.s. copra	3.30
Straits f.m. copra	3.00
Sub-grade copra	2.70

Table IX.

Relative Market Values of Produce Obtained from the Same Theoretical Weight of Coconut Meat.

Lot	Trial A Continuous Warm Storage			Trial B Cool and Warm Storage		
	Final Dry Weight	Price of Copra per picul	Value of Copra	Final Dry Weight	Price of Copra per picul	Value of Copra
	piculs	$	$	piculs	$	$
W 1 ...	100	3.40	340.00	96.2	3.30	318.00
W 2 ...	97.2	3.30	321.00	97.4	3.30	321.00
W 3 ...	90.5	3.00	271.50	86.1	2.70	232.00
R 1 ...	96.8	3.30	319.00	91.9	3.00	275.70
R 2 ...	97.0	3.00	291.00	86.3	3.00	258.90
R 3 ...	93.5	3.00	280.50	85.0	2.70	229.00

The figures show clearly the extent to which deterioration can affect the value of the copra. Thus in the case of Trial B, Lots W3 and R3, the value of the copra is only about two-thirds that of the highest grade.

Conclusions.

(i) Copra is subject to loss and deterioration during storage and transport, unless properly prepared and promptly warehoused.

(ii) Such deterioration proceeds most rapidly at air temperatures and is reduced or checked at higher temperatures and temporarily by a film of smoke on the surface of the product.

(iii) Loss and deterioration are very considerable in the case of "raw" half-dried copra if there is delay before it is suitably bulk stored.

(iv) When there is serious deterioration, the individual pieces of copra readily break down to yield "smalls" and "dust."

Discussion.

Since the foregoing investigations reveal that half-cured copra is such an unstable and unsatisfactory product, it may seem strange that well in excess of half the world's copra is produced in this condition while, here in Malaya, much of the imported copra and some even of the copra produced in this country still continues to be of this quality. It is an unfortunate fact that such copra has a trade value and so is saleable. It offers peculiar opportunities for profit-making to the small dealer which are not realizable with a more stable and reliable copra. Where all

producers offer the same low grade of product, they cannot readily appreciate that they are not obtaining the maximum return from their palms.

It is not appreciated sufficiently, if at all, that not only are deterioration, previous to, during, and immediately after production, and the moisture content taken into account in the prices paid by local traders for "mixed" copra but also that the ruling or basic price, paid in any one district, is a reflection of the ultimate general quality of the copra from that particular district, and includes adequate compensation to the dealer to discount all loss and deterioration which normally occur with such copra during transport and storage subsequent to production.

Small dealers have never been found willing to encourage the production of a stable and reliable product as they claim that small lots of such copra are of little use to them. In those districts where a market for low-grade "raw" copra is firmly established it is therefore quite useless for an individual small producer to make drier and better copra, since he then obtains less copra, which is nearly always paid for only at the current local price. The most he can ever expect in return for his extra trouble is a price strictly proportionate to the reduction in moisture content but this allows no extra profit whatever for improved appearance and quality.

The best copra is usually made and the best local prices are paid in the immediate neighbourhood of the export centres and the oil mills. This is because little time normally elapses between production and storage in bulk, and thus any "raw" copra which may be produced will not seriously deteriorate subsequent to sale. It is thus possible for a high standard of quality to be established, and in such circumstances low-grade copra is exceptional and is likely to be penalized if offered.

The worst copra is usually produced in the more inaccessible regions whence parcels can be shipped only at irregular or long intervals, with consequent long delay before bulk storage. Despite the desirability of producing only dry copra in such regions, there is here, as elsewhere, an unfortunate natural tendency for the quality of copra produced to decline during periods of low or falling prices, particularly the latter, since drying is then liable to be curtailed so as to obtain a greater weight of copra or to make a quick sale while prices are still high.

This is a trend which it is not easy to reverse for it is not reasonable to expect individual producers to lose money by producing copra which is above the local standard of quality and dryness. It is frequently stated that producers are apathetic but it would be more correct to say they are helpless in the face of existing trading conditions.

Acknowledgment.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

3rd Quarter, 1939.

Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

July and August were very dry months and conditions approaching to drought existed in many parts of the country. The wet season commenced earlier than usual, September rains being generally above average.

Prices.

Tables I and II summarize prices paid for small-holding rubber during the quarter.

Uncouponed rubber improved considerably in value, rising from between $7 and $8 per picul in July and August to $16 to $20 in September. Coupon values varied considerably, but generally were lower in value at the end of the quarter. In Kelantan coupons rose from $22.75 per picul equivalent in July to $30 in September. In Perak South, however, while coupons rose from between $25.50 and $27 in July and August to between $33 and $36 early in September, they fell by the end of that month to $23 to $24. Other reports also indicate that coupon values fell at the end of the quarter.

Production and Quality of Rubber.

Production of rubber on small holdings during the year is summarized in Table III. Production for the quarter was nearly 39 per cent. of the total production for the same period, or equivalent to the ratio small holdings bear to the total planted acreage of Malaya.

In Kelantan, Instructors and Demonstrators have continued to be fully employed on smoke-house construction and in demonstrating the production of better quality sheet. There are 25 smoke houses under construction, and a further 24 awaiting construction.

In Perak South two new smoke cabinets are under construction, one being built in connexion with a new co-operative marketing society which has recently been formed.

The Malacca report states that much improvement can be seen in sheet manufacture due to the advice of Asiatic Rubber Instructors.

General Conditions on Holdings.

In Pahang it is reported that greater interest is being taken in the upkeep of holdings, particularly with respect to cover crops and soil wash. The interest in cover crops is most clearly seen where new planting and replanting is being carried out.

Table I.

Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul of 133 1/3 lbs.)

3rd Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				JULY					
Smoked sheet	33.00-37.00	32.00-36.50	32.20-35.90	33.50-36.00	31.00-36.25	35.00-37.00	32.70-37.00	31.50-36.00	34.50-35.50
Unsmoked sheet	32.00-36.00	30.00-34.70	30.00-35.00	32.00-35.00	30.00-34.50	34.00-36.00	32.30-35.80	31.50-35.30	32.50-33.00
Scrap	24.00-25.00	27.00-28.00	26.20-27.40	—	—	29.00-31.50	26.00-28.50	26.50-30.50	24.00-25.00
				AUGUST					
Smoked sheet	33.00-37.00	32.75-36.00	32.00-36.00	34.00-36.30	31.50-35.80	34.50-37.15	33.60-37.40	32.00-35.60	31.00-34.00
Unsmoked sheet	32.00-36.00	30.75-35.00	30.00-34.90	32.00-35.20	30.50-34.50	33.50-35.80	30.00-36.20	30.10-35.50	29.00-31.50
Scrap	24.00-25.00	27.00-28.00	26.25-27.50	—	—	28.00-30.50	26.00-29.00	26.20-31.00	23.50-26.00
				SEPTEMBER.					
Smoked sheet	37.00-52.00	33.60-47.00	34.00-47.30	35.00-47.00	33.20-46.30	42.50-46.00	34.00-48.00	33.00-48.00	37.00-42.00
Unsmoked sheet	35.00-51.00	32.00-45.25	33.30-44.00	33.00-45.00	34.00-41.50	40.50-44.00	31.80-46.60	31.00-49.00	35.00-38.00
Scrap	24.00-31.00	32.00-35.00	27.00-37.00	—	—	30.50-35.00	28.00-35.00	24.00-34.75	30.00-33.00

Table II.

Mean of Highest and Lowest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul of 133 1/3 lbs.)

3rd Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				JULY					
Smoked sheet	34.20-36.35	33.83-35.16	34.18-35.47	34.22-35.40	33.27-35.17	35.77-36.50	33.90-35.70	33.65-35.21	34.50-35.50
Unsmoked sheet	33.50-35.45	32.04-33.55	32.50-33.73	33.10-34.27	32.08-33.58	34.50-35.50	32.60-34.30	32.98-34.28	32.50-33.00
Scrap	24.00-25.00	27.00-28.00	26.20-27.40	—	—	29.67-30.50	27.17-28.17	27.56-28.97	24.00-25.00
				AUGUST					
Smoked sheet	34.25-36.50	34.08-35.30	34.27-35.52	34.34-35.66	33.73-34.90	35.50-36.05	34.40-36.13	34.00-35.18	31.00-34.00
Unsmoked sheet	33.12-35.00	32.60-33.87	32.15-33.48	33.00-34.34	32.86-33.62	34.17-34.93	31.97-34.50	32.82-34.50	29.00-31.50
Scrap	24.00-25.00	27.00-28.00	26.25-27.50	—	—	29.00-29.83	26.90-28.23	27.61-28.84	23.50-26.00
				SEPTEMBER.					
Smoked sheet	41.00-48.85	37.27-44.28	38.47-44.22	37.10-45.30	36.31-43.69	43.83-44.67	36.20-46.00	37.63-44.73	37.00-42.00
Unsmoked sheet	39.00-46.50	35.06-41.36	35.83-40.20	35.90-42.30	34.96-40.30	42.07-42.83	34.30-43.03	36.50-42.94	35.00-38.00
Scrap	26.33-29.33	32.00-35.00	27.00-37.00	—	—	31.67-33.17	28.33-33.00	28.19-32.09	30.00-33.00

Table III
Production of Rubber on Small Holdings.
(in tons)

	Total Jan. to Sept. 1938	1st Quarter 1939	2nd Quarter 1939	3rd Quarter 1939	Total Jan. to Sept. 1939
Federated Malay States ...	44,241	10,875	9,729	18,601	39,205
Straits Settlements ...	7,951	2,123	2,054	2,888	7,065
Unfederated Malay States ...	41,427	11,450	10,562	17,347	39,359
TOTAL MALAYA ...	93,619	24,448	22,345	38,836	85,629

In Perak the slashing of undergrowth and digging of drains have been carried out on many small holdings. It is also reported that *lalang* grass has been dug out on some Chinese and Indian holdings in Upper Perak.

Tapping.

Tables IV and V, which summarize the results of the quarterly survey of small holdings, show clearly the considerable increase in tapping which took place at the end of the quarter. A large number of holdings were brought into production which had not been tapped for some considerable time. Some reports indicate that tapping was very restricted during the months of July and August.

Planting.

Small-holders have shown less interest in replanting in some districts due to the higher prices now ruling. Small-holders were also deterred from proceeding with replanting by rumours which unfortunately became current in many localities that rubber regulation was being terminated and that, therefore, there would be no coupon issue during the growth period of replanted rubber.

The Pahang report states that, owing to the heavy rush of applications for new planting, a number of small-holders will have to wait until 1940 before completing felling and planting.

All reports indicate that small-holders are taking steps to secure budded material for new planting and replanting.

Pests and Diseases.

The wet weather in September encouraged the spread of Mouldy Rot, but the usual methods of control were satisfactorily applied.

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of September, 1939.

PERAK			
District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	8,700	24
Kinta	38,874	5,800	15
Kuala Kangsar	92,166	30,400	33
Upper Perak	15,590	4,100	26
Larut & Selama	43,132	3,500	8
Krian	9,408	7,500	80
Lower Perak*	26,735	8,800	33
Dindings	9,873	7,300	74
	271,965	76,100	28

SELANGOR			
District	Total Tappable area	Total area untapped	Percentage
Klang	16,143	4,400	27
Kuala Langat	23,881	5,500	23
Ulu Langat	45,012	8,600	19
Ulu Selangor	31,463	11,300	36
Kuala Lumpur	20,277	9,700	48
Kuala Selangor	8,417	3,800	45
	145,193	43,300	30

NEGRI SEMBILAN			
District	Total Tappable area	Total area untapped	Percentage
Seremban	23,639	19,800	84
Tampin	21,896	14,900	68
Kuala Pilah	31,832	12,700	40
Jelebu	9,097	1,400	15
Port Dickson	11,133	8,700	78
	97,597	57,500	59

PAHANG			
District	Total Tappable area	Total area untapped	Percentage
Raub	10,534	8,700	83
Kuala Lipis	15,457	3,300	21
Bentong	12,224	3,000	25
Other Districts†	40,373	18,100	39
	84,588	33,100	39

MALACCA			
District	Total Tappable area	Total area untapped	Percentage
Central	14,093	6,800	49
Alor Gajah	30,838	13,200	43
Jasin	25,286	5,100	20
	70,217	25,100	36

PENANG & P. WELLESLEY			
District	Total Tappable area	Total area untapped	Percentage
North	3,549	500	15
Central	10,785	5,300	49
South	8,936	400	5
Penang	15,822	300	2
	39,092	6,500	17

SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage
Singapore	20,115	800	4
	20,115	800	4

JOHORE	350,007	66,500	19
KEDAH	102,126	27,600	27
KELANTAN	49,133	9,300	19
PERLIS, TRENGGANU ‡	2,916 / 29,836	800 / 8,400	28 / 28

The percentage of areas out of tapping in June, 1939, was as follows:—Perak 50, Selangor 59, Negri Sembilan 79, Pahang 48, Malacca 48, Penang and Province Wellesley 38, Singapore 6, Johore 26, Kedah 42.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.
Comparisons of Areas of Rubber Small Holdings Out of Tapping

	September, 1938		June, 1939		September, 1939	
	Acres	Per-centage	Acres	Per-centage	Acres	Per-centage
F.M.S. ...	274,800	45.9	338,100	56.4	210,000	35.0
S.S. ...	42,800	33.0	49,800	38.5	32,400	25.0
U.M.S. ...	137,600	25.7	155,400	29.1	122,600	21.0
Malaya ...	455,200	36.0	543,300	43.0	355,000	28.0

Oidium Heveae was recorded on many small holdings in Bentong, Pahang, during refoliation after unusually severe secondary "wintering." The Pahang report also mentions that greater attention is now being paid by small-holders to soil erosion than formerly.

Root diseases are common in many parts of the country, but it is often difficult to persuade small-holders to take the necessary steps to eradicate them.

In Perak South termites attacked a small-holders' co-operative nursery of budded stumps, causing the death of approximately 275 out of 700 plants. The same report states that a severe infestation of cockchafers occurred on a collection of small holdings. The area is under observation.

General.

In Selangor three sales, totalling 53 piculs of rubber, were made from the co-operative smoke-house at Ijok. With the increase in prices interest in co-operative sales has decreased.

In Johore the sale of latex by small-holders has been extended to other districts. In some localities sales of latex ceased towards the end of the quarter as small-holders considered that they would obtain a better price for sheet rubber.

In Kuantan District, Pahang, sheds to house coagulating equipment are being erected. The same report states that the co-operative purchase of coagulants (through the Asiatic Rubber Instructor or local co-operative society) is gaining favour in view of the difficulty small-holders are experiencing in obtaining acid from local shops.

Several reports comment on the increase in the price of formic acid and shortage of supplies. The price has risen from 50 cents to $1 to $1.30 per pint, and in Kelantan shortage of supplies has tended to make small-holders revert to the use of alum, of which supplies are more or less normal. In parts of Perak the price of empty kerosene tins, and hence that of coagulating pans, has increased by approximately 100 per cent.

QUARTERLY REPORT ON THE MALAYAN PINEAPPLE CANNING INDUSTRY.

June to August, 1939.

Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S., from Reports of the Field Branch.

Factories.

The total number of registered factories stated in previous reports has referred only to actual canning establishments. Under the law, however, peeling sheds also are considered and described as registered factories; hence to avoid confusion the position might be summarized thus: the total number of registered factories is twenty; of these, three are peeling sheds only, one is a factory used solely as a peeling shed, while the remaining sixteen are canning establishments proper. Of the sixteen factories proper, ten only were operating during the latter half of the main pineapple season, which ended in August; of these, five were in Johore, four in Singapore and one in Selangor. The other registered factories were not working owing to the quota restriction scheme and instead sold their quota to operating factories through the Central Board. The registration of one non-operating Singapore factory was cancelled during the quarter under review because the firm was not a member of a recognized association.

Production and Sales.

The Central Board's production quota for the season 1st April to 30th September, 1939, was originally fixed at 1,000,185 cases but in June this was increased to a total of 1,200,445 cases, while individual packers were allowed a permissible excess not exceeding 5 per cent. without penalty.

The increase in quota was intended to meet an anticipated decrease in pack due to decreased fruit supply during the next quota year and to make it possible to carry out selective packing so as to be able to fulfil requirements under outstanding contracts for "golden" qualities. A surplus of fruit also made it imperative to increase the quota, if reasonably possible. The total production for the April—September season ultimately amounted to 1,277,298 cases, and an increase in reserve stock was duly secured.

Total exports of canned pineapples from this country for the quarter under review amounted to 21,810 tons and were valued at $2,528,974. Monthly exports for 1939 up to the end of August were as follows:—

Month		Quantity tons	Value $
January	...	4487.16	507,122
February	...	6883.83	754,314
March	...	7615.69	844,686
April	...	9276.73	1,025,524
May	...	10224.34	1,164,226
June	...	8207.56	941,756
July	...	7928.78	921,009
August	...	5673.53	666,209
Total	...	60,297.62	6,824,846

Canned and Fresh Fruit Prices.

Prices in Singapore per case of 48 cans of 1½ lbs. each as fixed by the Central Board during the three months under review remained unchanged at the following prices in Straits dollars:—

	General Average Quality (G.A.Q.)	Golden.
Sliced Flat	... $3.20	$3.60
Sliced Tall	.... 3.35	3.75
Cubes	... 3.25	3.65

Prices per 100 of fresh fruit varied as follows:—Singapore 50 cents to $2.10, Johore 50 cents to $2, Selangor 58 cents to $1.10, depending on size, quality and on place of sale, *i.e.* whether at factory or in field.

There was considerable activity between growers and packers' representatives and officers of the Department of Agriculture with a view to settling questions concerning fresh fruit prices in the field, standards of quality and the like. Proposals based on the recommendations of an informal committee in this connexion are at present under consideration by the Central Board.

Government Research Station and Canning Factory.

Several full-scale demonstration runs were arranged for the benefit of packers, shippers and others connected with the canning industry. These aroused great interest.

Research during the period under review has been concerned with the Sarawak pineapple, pineapple juice and can-closing machinery. The findings may be summarized as follows:—

(*a*) The Sarawak pine can be canned satisfactorily by the ordinary exhaust and open tank cook process as recommended for use with the Singapore Canning pineapple. The Sarawak pine is very suitable for canning; it gives less waste and when properly canned may be claimed to have an appearance and flavour closely resembling that of the Hawaiian product. Compared with the Singapore fruit, it is stated to possess a superior flavour though the colour is not of such a light golden shade.

(*b*) There are preliminary indications that the technique of preparation has a greater effect in controlling the flavour of pineapple juice than does the type of fruit used. Work is in hand to discover how the flavour and colour may be improved.

(*c*) It has been established that the fully automatic can-closing machine cannot be recommended for use in conjunction with local hand-made cans. A comparatively high proportion of damaged and leaky cans results from this combination. Further trials using combinations of machine and hand-made cans together with hand and fully automatic closers are in progress.

General.

Reports from Singapore indicate that many of the older areas under pineapples have gone out of cultivation or have been planted with other crops, but several small new areas have been planted recently. The exact area under pineapples at the end of the period under review is not known, but is under investigation. The greater part of the fruit canned in Singapore continued to be drawn from Johore. Selangor reports indicate that there was no new planting during the quarter, though there was very heavy fruiting in producing areas.

Abstracts.

REPORT ON A VISIT TO MALAYA, JAVA, SUMATRA AND CEYLON

BY

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THE NETHERLANDS INDIES.

Following his visit to Malaya,* Sir Frank Stockdale visited Java and Sumatra with the object of studying at first hand the agricultural methods in vogue in those countries and the organizations which have been built up for research and advisory services. His report, due to certain exigencies, is limited to those items which would appear to be of the greatest interest to agriculturists in the Colonial Empire at the present time.

Soil Problems.

The outstanding impressions received as a result of the visit to the Netherlands Indies were the importance which was attached by all to soil conservation and the maintenance of soil fertility. In Java, the measures taken to conserve soil and preserve its fertility have already reached a high standard. These measures have been necessitated by the density of the population and have been favoured by the natural richness of many of the island's soils; they consist chiefly of the extensive use of irrigated terraces, supplemented by forest reserves on the higher slopes of mountains, while shade trees and green manures are widely employed. Forests represent about one quarter of the total area of the island, while terraced "sawahs" account for $3\frac{1}{4}$ of the $7\frac{3}{4}$ million hectares occupied by small-holders. While many of these are irrigated by primitive means, the majority are irrigated from an elaborate and extensive system of dams and reservoirs, a noteworthy feature of which is the excellent control organization. Water containing injurious constituents is diverted and allowed to run to waste, while that containing silt or soil fertilizing agents is carefully distributed by the irrigation system, thus helping to maintain soil fertility.

In the Outer Provinces (Sumatra, Borneo, Celebes, etc.) the position is less satisfactory. Compared with Java, the soils are less fertile while the density of the population is only about one-tenth as great. Shifting cultivation, with all its disadvantages, is the rule on a very large proportion of the agricultural land and the Government is now contemplating a more active forest policy and the development of irrigation schemes with a view to correcting the erosion and loss of fertility in these areas.

Estates both in Java and Sumatra pay particular attention to soil conservation. The use of ground cover, consisting either of cover crops or of selected soft weeds,

* See *Malayan Agricultural Journal* for September, 1939.

is general; contour drains and silt pits are commonly employed, while terraces are used in certain localities. The early application of such methods may possibly be attributed in part to the fact that a very fair proportion of estate managers and assistants in the Netherlands Indies have received prior to their appointment the full agricultural training, with specialization in tropical agriculture, provided at the Agricultural College at Wageningen in Holland.

Experiment Stations.

Agriculture in the Netherlands Indies has been well served by its Experiment Stations. Work for peasant agriculture has been centred at the General Agricultural Experiment Station, Buitenzorg, which is maintained from Government funds. This Station has also carried out important work for estate agriculture, but this work has been increasingly transferred where practicable to the Experiment Stations maintained by crop interests—a chain of which provide research and advisory services for the rubber, tea, coffee, cacao, cinchona and sugar industries.

The work of these Stations is described and Sir Frank Stockdale feels that his observations made in regard to cinchona and sisal may be of particular value to British Colonial interests.

The high standard of agricultural research work in the Netherlands Indies is almost proverbial and the importance which has been and still is attached there to crop improvement by plant breeding is particularly noteworthy. Not only have plantation crops been improved, but most valuable work has been done in connexion with food crops and in the evolution of strains of plants resistant to various pests and diseases. The valuable co-operation offered by the scientifically-trained estate personnel has been of considerable assistance to the plant breeders in their efforts to improve plantation crops.

The British Colonial Empire can learn much from the achievements of the Dutch in the Netherlands Indies and it is clear that greater emphasis should be given in future to the work which can be performed by plant breeders for the development of tropical agriculture. The number of plant breeders in Colonial Departments of Agriculture is clearly too small if progress is to be maintained or its rate improved.

Agricultural Education.

Agricultural education has received considerable attention in the Netherlands Indies. The Agricultural High School at Buitenzorg provides a very thorough three years course in agriculture and forestry, in which considerable emphasis is placed not only on agricultural subjects *per se* but also on building construction, irrigation, motor and electrical engineering, and surveying. The diploma of this School is accepted for entry into the extension services of the Department of Agriculture, the Forest Service, and the plantation industry, and the average of 20 students who leave each year usually find little difficulty in obtaining employment.

The Secondary Agricultural School at Malang also provides a three years course in agriculture and forestry and an additional fourth year for those students who intend to seek employment in the plantation industry. This fourth year is devoted to theoretical and practical mechanics, construction, general and electrical engineering, and work of a similar nature. From 40 to 50 students leave the School each year.

A system of Farm Schools was started some years ago for boys selected from the highest standards of elementary schools. Emphasis is placed on practical aspects of agriculture and the object is to provide a sound agricultural training for the sons of small-holders, with a view to raising the standard of village agriculture. Owing to the fact, however, that there is no spare land in Java for the pupils to occupy and that little improvement has been noticeable in agricultural methods after the return of these trained pupils to their homes, it has been decided gradually to abandon the Farm School system in Java, and to provide for the introduction of agriculture into the curriculum of selected rural elementary schools instead. The Farm School may prove more successful in the Outer Provinces, particularly where colonization is practicable or under contemplation.

Facilities exist for training selected teachers from the rural schools in theoretical and practical agriculture. The sixth year at such elementary schools is, in the case of selected pupils, devoted to the rudiments of village agriculture, while the agriculturally-trained teachers also give village courses once or twice a week to such cultivators as desire to attend them.

Credit Facilities.

Credit facilities are provided in the Netherlands Indies through the People's Bank, Village Banks, Padi Banks and Co-operative Societies.

The People's Bank has seventy branches and is mainly used by the urban worker. There are 7,000 Village Banks and these are largely used by petty traders and urban communities generally, while Padi banks, of which there are also 7,000, provide credit facilities for the rural population.

These Padi Banks advance three loans of uniform amount to the padi cultivator each season; the first is made at the time of cultivation, the second at transplanting and the third just before harvest. Stores are provided for the padi after harvest, and from the padi deposited therein by the cultivators refunds of the loans issued are made. Both loans and the interest thereon may be repaid in kind, *i.e.* in padi.

There are also some 400 Co-operative Societies. They have been found most effective in those districts where the members have attained a certain degree of education and business knowledge, and are frequently associated with the existence of national spirit on the part of members. The credit thus provided is hence largely urban, though it is held that co-operative societies for providing rural credit may also make sound progress where a combination of education and business sense exists. Attempts are being made in some rural districts where indebtedness is general to liquidate the latter over a period of years *via* the medium of "relief"

co-operative societies. Such societies are undoubtedly meeting with a measure of success though it is yet too early to say whether this method of dealing with rural indebtedness will be generally successful.

It will be noted that the co-operative movement is almost entirely concerned with credit. Marketing societies have not up to the present been attempted as the very numerous petty traders would probably offer too keen competition for them to succeed.

CEYLON.

The three major agricultural industries of the island—tea, rubber and coconuts —have now each a separate Research Institute or Scheme. These are firmly established and doing most useful work for the industries for which they were created, while the establishment of these separate institutes has enabled the Department of Agriculture to pay greater attention to the needs of those growing padi and other secondary crops and to the agriculture of the peasant small-holder generally.

Tea Research Institute.

The Tea Research Institute was founded in 1925 and has performed useful research in all phases of the tea planting industry. An advisory service for tea-growing small-holders has also been evolved, with a result that considerable improvement is already apparent.

Soil erosion is a serious problem in many tea-growing districts and is receiving considerable attention from the staff of the Institute. Investigational work is now being performed on the decomposition of plant materials, the effect of covers on yields, and the value of green manures in tea cultivation.

The practice on some estates of removing all plant debris and leaves from the soil surface, with the object of making compost, is to be deplored. Large areas of bare soil exist as a result of this practice, with consequent erosion and deterioration, and it is hoped that definite efforts will be made by all concerned to effect improvement generally in this connexion throughout the tea growing districts.

Rubber Research Scheme.

The standard of agricultural and technological research conducted under the Rubber Research Scheme is very satisfactory. The major activities are concerned with the selection and testing of improved planting material, the prevention of soil erosion on hilly land, and the use of cover crops. Oidium leaf fall disease, which is now common, is receiving attention, and while sulphur dusting is held to be an economic control measure, it is suggested that the real long-range view in regard to this disease must be the evolution of strains of rubber resistant or immune to the disease.

The prospects of developing rubber-manufacturing industries in the island are not encouraging, but it is suggested that attention should be given in Ceylon, as it has been in India and the Netherlands Indies, to the development of rubber-tyred wheels on bullock carts, which are still largely employed for transport purposes. A local outlet for rubber might thus be created.

Coconut Research Scheme.

The work under the Coconut Research Scheme is well organized and is appreciated by an ever increasing circle of producers. It has consisted largely of technological investigations in regard to copra, soap-making, the utilization of coir fibre, crop improvement, and manuring, including the use of green manures. A further critical study of the mechanism of coconut pollination under Ceylon conditions appears to be desirable in view of the difference of opinion which appears to exist in this connexion between the investigators in Malaya, Ceylon and South India.

Department of Agriculture.

The work of the Department of Agriculture is now largely concerned with those crops, other than tea, rubber and coconuts, which are of common or potential occurrence in peasant small-holding agriculture. The work has been largely educational and has paid special attention to padi, fruit cultivation, cacao, cotton, castor, cashew, chilli, citronella, coffee, sesame, eleusine and tobacco. Very considerable progress has been made with fruit growing, especially with citrus, and stock and manurial trials are being carried out with grapefruit, oranges and mandarines. Mangoes, pineapples, and fruit-canning also are receiving attention.

While satisfactory advances have been made with animal husbandry and poultry keeping, and with recent attempts to interest small-holders in soil conservation, it is felt that insufficient work is being done in connexion with the padi crop. For a period, selection work ceased, and since there can be no doubt that Ceylon should produce more of its rice-requirements the recent appointment of a Padi Specialist is commended. Co-operation is progressing slowly, while small-holders hold in high esteem the work of the Department concerned with agricultural marketing.

In conclusion, it is encouraging to see the developments in agricultural research and the interest that is being taken in their practical application, and while much remains to be done it is satisfactory to record that considerable efforts have been made in Ceylon by means of advisory services, propaganda and education to interest all, including small-holders, in the measures which can be taken to improve that island's standard of agricultural practice.

D.

LEGISLATION AND THE COCONUT INDUSTRY IN THE PHILIPPINES. *

Historical.

Sovereignty over the Philippines was ceded by Spain to the United States in 1899. From the very beginning, American policy has been to enlarge Philippine autonomy with political independence as its final goal, but on the other hand increasingly stronger economic ties have been made to bind Philippine economy to that of the United States. From 1913 onwards, for instance, unrestricted free trade was practised between the two countries, one result of which was a tendency to draw Philippine export staples away from the various competitive world markets towards the more profitable protected American market. In 1937, for example, 82 per cent. of the total Philippine exports were to the American market, a market which has absorbed nearly all the exported coconut oil and desiccated coconut products, and three-quarters of the copra exports.

The Independence Act, 1934.

The year 1934 marked the beginning of a period of restrictions. The Independence Act placed restrictions upon the quantities of certain Philippine agricultural products, including coconut oil, which may enter the United States free of duty. The duty-free quota permitted in the case of coconut oil, for instance, was limited to 200,000 long tons. To help industries dependent on the American market to adjust themselves to a non-preferential status after independence, the Act provides for the imposition by the Philippines of progressively graduated export taxes upon Philippine products shipped to the United States. These taxes commence in 1940 and increase by 5 per cent. per annum of the United States duties to reach a maximum of 25 per cent. thereof in 1945; their proceeds are to be used solely in the retirement of the Philippine bonded debt. Finally, the Act implies that after July, 1946, following the granting of political independence, Philippine export products will be subject to full duties under the American tariff.

Other restrictions have since been imposed. The United States Revenue Act of 1934 and subsequent legislation, for instance, imposed an excise tax of 3 cents per lb. on Philippine coconut oil whether processed in the Philippines or in the United States. The proceeds of these and similar taxes are being remitted to the Philippine treasury for economic adjustment purposes, but this practice will of course cease when independence is attained in 1946.

Anticipated Effects on the Philippine Coconut Industry.

The economic provisions of the Independence Act, principally, the graduated export taxes, together with the United States Revenue Acts of 1934-36, will have a

* Abstracted from "The Report of the Joint Preparatory Committee on Philippine Affairs and Proposed Amendments to the Economic Provisions of the Independence Law", by Jose E. Velmonte, published in the *Philippine Agriculturist*, Vol. XXVIII, No. 5, October, 1939.

profound effect on the exportation of all Philippine coconut products to the United States, but their severity has been mitigated somewhat by the legislation described later in this summary.

Under the Independence and Revenue Acts, the duty-free quota for coconut oil is 200,000 long tons, an amount somewhat larger than normal exportation. All other coconut products are not similarly restricted. From 15th November, 1940, however, progressive export taxes will apply to coconut oil, copra cake and meal, and desiccated coconut. Copra being on the "free list" has never enjoyed any protection and it will not likely suffer from any adverse effects.

The coconut oil industry competes with a similar industry in the United States. About 50 per cent. of the coconut oil consumed in the United States is produced by Philippine mills, the remainder being supplied by domestic mills using Philippine copra almost exclusively. The imposition of export taxes will affect seriously the coconut oil trade. Philippine and American mills obviously buy Philippine copra on the same price basis, and any advantage local mills may have over United States mills must be found in the relatively small cost of crushing copra which is estimated to be less than $\frac{1}{2}$ cent per lb. Philippine producers maintain that there is hardly any advantage; hence, the imposition of 0.1 cent export tax during the sixth year of the Commonwealth will prove crucial to the local oil industry, as the margin of profit present is estimated to be from 1/8 to 1/10 cent per lb. By the seventh year of the Commonwealth, the export tax of 0.2 cent per lb. will far exceed present profits and, therefore, will liquidate the business. The probable result, therefore, will be to transfer the crushing industry from the Philippines to the United States. This will mean also the loss of copra meal and cake as an export.

There is, however, a compensatory gain in that copra exports should increase by an amount approximately corresponding to the loss of coconut oil. Desiccated coconut will be subject to export taxes, the full duty at present being 3.5 cents per lb. United States' imports in recent years are largely from the Philippines, representing about 97 per cent. of the total. It is the belief that trade in this product will not be very seriously affected by export taxes since, even in the tenth year of the Commonwealth with an export tax of 0.875 cent, the remaining tariff preference over the Ceylon product will still be over 2.6 cents. After independence, the effect is problematical; the belief is that it will be able to retain a large fraction of the American market despite the duty.

The U.S. Revenue Acts of 1934, 1935, and 1936 impose an excise tax on Philippine coconut oil, whether processed in the Philippines or in the United States, of 3 cents per lb., and on foreign coconut oil of 5 cents. While there is a tax preference in favour of Philippine oil, many domestic oils which are competitive are tax exempt, and many of these oils when imported from foreign countries pay excise taxes not higher than 3 cents. Consequently, the effect of the excise on Philippine

coconut oil will be to lower its competitive position in the American market. Domestic oils have increased in price, while Philippine coconut oil has been depressed in price. The situation becomes more critical because there have sprung up new competitors which are tax exempt and some also duty-free, as for example, babassu oil.

After independence, the imposition of the non-preferential rate of 5 cents will further weaken the competitive position of Philippine oil and seriously injure the whole coconut industry. One ameliorating circumstance is that the Philippine government during the Commonwealth period will receive the proceeds of excise taxes.

The Philippine Economic Adjustment Bill.

The abrupt changes inherent in the economic provisions of the legislation described in the foregoing sections would inevitably have affected adversely a number of Philippine export industries, as well as those American industries concerned with exports to the Philippines. A Joint Preparatory Committee on Philippine Affairs was therefore created to examine the inequalities or imperfections of the Act. Its findings indicated that, while copra, being on the "free" list, would suffer no adverse effects, the other principal Philippine exports, excepting sugar and cordage but including coconut oil, would probably be destroyed by the tax. The Committee therefore recommended, *inter alia,* that trade preferences should be extended, although gradually diminished, until the end of 1960, and efforts were therefore made to have suitable legislation approved by the United States Congress.

The first omnibus Philippine Bill, incorporating all the recommendations of the Committee, met with no success hence a further emergency Bill (The Philippine Economic Adjustment Bill), which adopted only in part the recommendations of the Joint Committee, was therefore introduced as a compromise measure, and finally received the approval of Congress on 7th August, 1939. This Bill does not attempt to define United States—Philippine trade relations after the granting of political independence in July, 1946, but has as its main objective the relief of those Philippine industries which would otherwise have been adversely affected by the imposition of export taxes after 1940. The salient provisions of the Bill in so far as the coconut industry is concerned are as follows:—

(*a*) Export taxes are to be assessed on Philippine products entering the United States beginning 1st January, 1941, at 5 per cent. of United States duties on such goods, increasing progressively by 5 per cent. on every 1st January until they reach a maximum of 25 per cent. on 1st January 1945. Provided there is no change in the United States tariff Philippine (and other) copra will continue to enter that country on a duty-free basis.

(*b*) 200,000 long tons of coconut oil will be exempted from export taxes during 1940, the duty-free quota to be diminished by 5 per cent. on every succeeding 1st January until 4th July, 1946. Exports in excess of quota will be subject to full duty.

(*c*) The proceeds of Excise taxes on coconut oil are to be refunded to the Philippine Government, and these proceeds after 1st January 1939, are to be freed from previous restrictions in such a way as to permit expenditure for providing facilities for better curing of copra and for *bona fide* production loans to Philippine copra producers. This is considered a great victory for such producers, since it represents a reversal of the previous conditions which prevented them from obtaining any direct benefit from coconut excise taxes, and prohibited the proceeds of such taxes from being used to subsidize the coconut industry.

Finally, the Bill provides that at least two years before independence is granted (4th July, 1946) a joint United States—Philippine conference shall be convened to formulate recommendations as to future trade relations between the United States and the independent Philippine republic.

D.

Departmental.

FROM THE DISTRICTS.

Compiled in the Office of the Chief Field Officer from Monthly Reports of Agricultural Officers.

October, 1939.

The Weather.

During October wet weather was experienced in all parts of the country, but in most places the total rainfall did not exceed the average. In Negri Sembilan the rainfall was below normal.

There was very heavy rain in Malacca: from the 1st to 25th October more than 16 ins. were recorded at Pulau Gadong and Malacca town. Serious flooding occurred, particularly in the Malacca River valley and in the lower reaches of the Duyong River. Extensive damage was done to property and cultivation, and there were serious losses among livestock, particularly goats, pigs and poultry. The floods took a long time to subside and some rice fields were submerged for as long as 10 days: this naturally resulted in the complete destruction of the crop, but no estimate of the total loss can be made as on some areas where plants were destroyed replanting is being done.

There was also some flooding in Province Wellesley but little damage was done.

Crop Reports.

Rubber.—The price of smoked sheet remained at between $40 and $46 per picul. In most places smoked sheet now fetches $3 more than the unsmoked product. Many smoke cabinets are being brought into use again. With rubber at its present price small-holders are rather less interested in replanting. During October many holdings were brought back into tapping.

The outbreak of war caused a temporary interruption in the supply of coagulating acid. This has caused particular inconvenience to small-holders who normally buy their supplies of acid by the bottle and keep no stock. Regulations were passed at the end of September to fix the selling price of coagulants in the Federated Malay States and to prevent hoarding, and similar legislation has been enacted in the Straits Settlements and is under consideration in some of the Unfederated States.

In some of the more remote districts small-holders have banded together to purchase their supplies of coagulant direct from the large importers in Singapore, Kuala Lumpur or Penang.

Padi.—At the beginning of October large tracts of padi in North Kedah began to look yellow. This condition still persisted at the end of the month. It is thought that it may be due to the severe drought which occurred after planting during the second half of August, although no ill-effects were noticeable in September when water supplies were again adequate. It is feared that the crop is not likely to be so good in the affected areas.

In spite of Puasa, transplanting has been continued on certain lots at Sungei Manik in Perak on which work had not been finished earlier.

The Government's policy to increase the area planted with padi is being pushed forward particularly vigorously in the Sungei Manik area. It is intended that the opening up of Stages IV and V should be accelerated by employing paid labour. Malays employed on this scheme who work well will have first claim to be allotted 5 to 6 acres of felled land for padi growing. Initially they will receive only a temporary occupation licence, but after 3 years, if the land has been brought into cultivation satisfactorily, a permanent title will be given. A bonus of $10 per acre will be given to all holders who have completely cleared and stumped their land within 12 months of entering into occupation.

The present programme provides for irrigation water on Stage IV in 1940 and on Stage V in 1941.

Surplus padi from this area will find a guaranteed market from 1st January, 1940, at $2.50 a picul at the new Government rice mill which is under construction at Teluk Anson. Good progress is being made with the building: all the machinery has been installed and it may be possible to start milling before the end of the year.

Bananas in Negri Sembilan.—Erosion on banana areas in Negri Sembilan has long been causing concern. Much of this land is very steep and the Chinese planters believe that if the plantations are not kept clean weeded the yield will be seriously reduced. Early in the year a simple experiment was put down on typical banana land to see exactly what effect the presence of cover crop would have upon the crop. The yields recorded from the three blocks of this experiment for the past 7 months show no reduction as a result of employing leguminous cover or *Mikania scandens* cover as compared with clean weeding.

Quarterly readings of soil loss are made at fixed points on the plots. The latest reading showed that at three of the six points in the clean weeded plot no wash had occurred, while at the other three points the wash varied from .3 to .5 in. At the three observation points in the leguminous cover plot no wash had occurred, but in the Mikania plot at the two lower points .5 in. of soil had been lost. The growth of the cover on the latter plot was initially slow and it was further retarded by the dry weather.

Food Crops.—An area of 336 acres of land at Changi near Singapore, at present planted with rubber, has been bought by Government with the object of allowing occupation of the land on temporary occupation licence for vegetable growing. Government will take possession of this land at the end of November and it is hoped that by that time applications will have been received for the greater part of the area.

Budding of Durians.

Fair success is now being obtained in budding durian at Selama Agricultural Station, Perak. The seedlings are grown rapidly in well prepared beds and budding is undertaken when the stocks are some 6 months old. Green unpetioled (semi-mature) budwood, on which the buds are somewhat swollen, is used. By employing this system much better success than formerly has been attained at this Station. Further, the budded plants, being still quite small, are more easily lifted than are older and larger plants.

RETIREMENT OF MR. B. BUNTING, N.D.A.

Mr. Benjamin Bunting, Senior Agriculturist, retired on 8th November, 1939, after more than 25 years in the Malayan Agricultural Service.

Mr. Bunting joined the Department of Agriculture as Assistant Agriculturist in March, 1914. He was promoted Agriculturist with effect from 8th March, 1920, being styled Agriculturist, Government Plantations. He was in charge of the four plantations, three rubber and one coconut, which the Federal Government owned at that time, in addition to the newly-opened Central Experiment Station, Serdang, as it was designated later. Mr. Bunting, who had experience as a planter before he joined the Department, conducted these plantations on sound and efficient lines, and the knowledge gained as a result of experiment work on the plantations was of great value to the planting industry at that time.

It is in connexion with Serdang that Mr. Bunting's name will long remain associated, and this well-laid out Experiment Station, widely known throughout the Colonial Empire, stands as a fitting memorial to his talent for organization and devotion to duty. Older members of the Department will remember his keenness and enthusiasm during the early days at Serdang, when the Station was being opened to accommodate the large collection of economic plants obtained from many parts of the tropics. Later, he was responsible for the erection of oil palm, coffee and tea factories at Serdang, all of which served to elucidate many problems arising from the preparation of these crops for market.

Consequent upon the disposal of the Government Plantations and the reallocation of work in the Division of Agriculture, the Experiment Station and Public Gardens, Kuala Lumpur, came under Mr. Bunting's charge. He took a keen interest in horticulture, and, as Honorary Secretary of the Public Gardens Committee, made many valuable horticultural introductions.

Early in 1926, the Experiment Station at Cameron Highlands was opened under Mr. Bunting's direction and he was responsible for the pioneer work at that Station.

Later the title of his appointment was changed to that of Senior Agriculturist. He acted as Chief Research Officer on two occasions and was acting in that appointment at the time of his departure.

His frequent contributions to the publications of the Department are further evidence of continuous valuable work in the realm of tropical agriculture. His most important contribution is the revised edition of "The Oil Palm in Malaya" of which he was senior joint author.

Although owing to indifferent health in recent years he has decided to retire at a comparatively early age, we hope that he will not sever his interest completely with tropical agriculture.

His colleagues in the Department and his numerous friends throughout Malaya wish Mr. and Mrs. Bunting many years of happiness in retirement.

C.D.V.G. & J.N.M.

FERTILIZER PRICES, NOVEMBER, 1939.

The following are the prices current for the month of November, 1939, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	80.00
Calcium Cyanamide ...	20.6	—	—	—	95.00
Muriate of Potash ...	—	—	—	50	115.00
Sulphate of Potash ...	—	—	—	48	120.00
Superphosphate (concentrated) ...	—	39	—	—	110.00
Superphosphate ...	—	16-18	—	—	65.00
Basic Slag ...	—	16*	—	—	52.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50¶
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total ¶ $31.50 per ton ex-warehouse, Singapore.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

Statistical.

MARKET PRICES.

October 1939.

Major Crops.

Rubber.—There was again considerable fluctuation in the rubber market, the maximum price variation during the month being 4½ cents. No. 1. X. Ribbed Smoked Sheet opened in Singapore at 34 cents per lb., fell to 33¼ on the 5th October, and then rose, with minor fluctuations, to close at 37¾ cents.

The average of daily quotations for the month was 35.88 cents per lb., as compared with 35.13 cents in September. The London average price was 10.16 pence per lb., and New York 19.68 cents gold, as compared with 9.59 pence and 21.03 cents gold respectively in September.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, October, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak		Kuala Pilah, Negri Sembilan				Batu Pahat, Johore.			
	4	18	5	12	19	26	4	11	18	25
Smoked sheet ...	40.00	44.12	40.00	42.50	45.00	—	—	40.00	—	44.00
Unsmoked sheet ...	38.00	—	—	31.00	43.00	43.50	37.91	39.41	41.50	42.76
Scrap ...	—	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 11th and 25th October.

Palm Oil.—According to latest information available a Government controlled price of £14.15s. per ton for palm oil is still in force in the United Kingdom.

Copra.—The sun-dried grade opened in Singapore at $3.65 per picul, but fell to $3.50 on the 10th October and remained unchanged at that price for the remainder of the month. The Singapore average price for the month was $3.52 per picul as compared with $2.88 in September. The mixed grade remained 30 cents per picul lower than the sun-dried grade.

Copra cake was quoted throughout the month at $2 per picul.

Padi.—The Government Rice Mills, Perak and Pahang, maintained their price of $2.20 per picul for padi. The Perak mills pay a bonus of 10 cents per picul for pure strain S.K. 48 padi. Retail prices of padi per 100 gantangs (gallons) were as follows:—Kedah $7.50; Province Wellesley and Penang $9.75; Perak North $12; Krian $8.40 to $9.40; Perak Central $11.37; Perak South $8 to $11; Selangor $10 to $14; Pahang $8 to $14; Kelantan $10.60; Johore $11 to $16; Brunei $10 to $12.

Pineapples.—Owing to the increased cost of materials, such as tinplate, sugar, and cases, the Central Board of Packers raised prices of canned pineapples during October. The new prices, per case of 1½ lbs. each, were: G.A.Q.: Sliced Flat $4.20, Sliced Tall $4.35, Cubes $4.25; Golden: $4.80, $4.95 and $4.85. The average prices for the month were: G.A.Q.: $3.95, $4.10 and $4; Golden: $4.50, $4.65 and $4.55.

Fresh fruit prices per 100 in Selangor were:—large $1.25 to $1.45, medium $1 to $1.15. In Singapore and Johore, prices of fresh fruit are now paid according to weight. In Singapore prices per 100 lbs. fresh fruit are 57 cents for fruits weighing between 1½ and 2½ lbs., and 66 cents for fruits over 2½ lbs. These prices approximate to $1.15 and $1.65 respectively per 100 fruits.

In Johore the corresponding prices are 46 and 53 cents per 100 lbs, respectively.

Beverages.

Tea.—No London prices are available.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 24th October, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb:—High Grown Teas Rs. 1.07, Medium Grown Teas 94, Low Grown Teas 86.

Coffee.—Liberian coffee opened in Singapore at $15.50 per picul, fell to $15, and closed at $15.50. Excelsa opened at $10 and improved to $10.50. Robusta was quoted throughout the month at $7.50.

The average of highest and lowest quotations in Singapore for Palembang coffee was $13.19 to $14.19 per picul, and for Sourabaya coffee $10.19 to $11.19. The September averages were $9.90 to $11.88 and $12.69 to $15.31 respectively.

Spices.

Arecanuts.—The Singapore Chamber of Commerce quotations per picul, which were stated to be approximate only, were:—Best $5.75, Medium $5.50, Mixed $5.25.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits $4.56 to $6.62; Red Whole $5.12 to $6.56; Sliced $9.19 to $13.38, as compared with $3.94 to $5.44, $4.69 to $6.44, and $6.56 to $8.63.

Pepper.—Quotations in Singapore were lower during the month, and average prices per picul were: Singapore Black $8.25, Singapore White $14.25, Muntok White $14.62, as compared with $8.65, $14.05 and $14.70 in September.

Nutmegs.—Only quotations at the close of the month are available and these are, per picul: 110's $32; 80's $40. In September quotations were $24.50 and $28 per picul respectively.

Penang dried nutmegs were sold at $19.50 per picul.

Mace.—No quotations are available. The September prices were: Siouw $85 per picul nominal; Amboina $46. Locally produced mace, dry, was sold in Penang at $70 per picul.

Cloves.—No quotations are available. September nominal quotations were $40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 23rd October, 1939, from Rs. 1.45 to Rs. 1.52 per lb.

Miscellaneous.

Derris.—There was little material change in the Singapore market during October, except that prices stiffened slightly. In many cases heavy rains interfered with cropping, and supplies consequently reached the market in small parcels only.

Roots sold on a basis of ether extract remained unchanged at $9 to $10 per picul, but roots sold on rotenone content averaged $20 to $22 per picul as compared with $18 to $20 in September.

Gambier. Block was not quoted, and Cube No. 1 was quoted throughout the month at $17 per picul. September prices were: Block $8 nominal, Cube No. 1 $17.

Sago.—Prices in Singapore fell during October. Pearl opened at $10 per picul and fell to $7.50, averaging $8.12. Flour, Sarawak Fair, opened at $7 and closed at $5.50, averaging $5.81. The September average prices were $7.90 and $5.71 respectively.

Tapioca.—Prices remained high. All grades opened at $9 per picul, fell to $8.25, but closed at $9 again, averaging $8.62. September average prices were: Flake Fair $6.87, Seed Pearl $6.95, Medium Pearl $7.05.

Tobacco.—The general range of prices of dried leaf per picul was: 1st quality $20 to $36; 2nd quality $10 to $30; 3rd quality $5 to $25. In Malacca the range was $36 to $40, and in Johore $12 to $38. Prepared tobacco in Johore ranged from $40 to $144. In Kelantan the range of prices of prepared tobacco was: 1st quality $85 to $170, 2nd quality $60 to $135, 3rd quality $40 to $115.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

MALAYAN AGRICULTURAL EXPORTS, SEPTEMBER, 1939.

PRODUCT	Net Exports in Tons				
	Year 1938	Jan./Sept. 1938	Jan./Sept. 1939	September 1938	September 1939
Arecanuts ...	33,769	27,926	30,798	1,543	5,684
Coconuts fresh†‡ ...	116,743†	76,907†	73,125†	8,398†	6,876†
Coconut oil‡ ...	49,140	33,574	44,972	4,759	5,449
Copra‡ ...	68,754	37,879	38,806	9,611	4,316
Copra cake ...	7,112	1,208	7,352	104	1,188
Gambier, all kinds ...	1,632	5,004	1,197	376	143
Palm kernels ...	9,359	6,292	7,227	880	730
Palm oil ...	54,377	41,999	41,959	6,353	2,623
Pineapples, canned ...	73,168	59,987	66,228	4,949	5,931
Rubber¶ ...	360,898¶	283,324¶	253,793¶	25,831¶	35,178¶
Sago,—flour ...	4,537	3,395	4,666	1,044	854
,, —pearl ...	4,203	3,181	2,876	420	546
,, —raw ...	5,088*	4,020*	3,768*	463*	565*
Tapioca,—flake ...	981	687	779	56	204
,, —flour ...	3,072*	2,390*	1,852*	148*	44
,, —pearl ...	17,818	13,441	13,963	1,598	2,735
Derris ...	676	407	912	71	186
‡Copra equivalent ...	150,944	93,975	113,347	17,512	13,307

† hundreds in number. * net imports. ¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4,242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
July ...	2,522.8	2,360.9	4,883.7	437.0	353.0	790.0
August ...	3,613.2	3,004.2	6,617.4	680.8	554.0	1,234.8
September ...	3,260.9	1,625.8	4,886.7	651.2	276.0	927.2
Total ...	22,877.2	19,607.8	42,485.0	4,204.9	3,299.1	7,504.0
Total January to September, 1938	21,420.4	15,705.4	37,125.8	3,775.2	2,597.0	6,372.2
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 30th Sept., 1939, were: palm oil 1,270 tons, palm kernels 1,545 tons.

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH SEPTEMBER, 1939.

STATE OR TERRITORY	Estimated Acreages of Tappable Rubber (9)+(11)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3)+(5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping (a)									
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)	Average	Percentage of (11) to (2)	Acreage	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S.S.—													
Province Wellesley ...	43,041	928	2.1	12,773	29.7	507	1.2	13,701	31.8	29,340	68.2	7,731	18.0
Malacca ..	118,010	2,581	2.2	32,259	27.3	1,995	1.7	34,840	29.5	83,170	70.5	24,574	20.8
Penang ..	2,505	nil	nil	1,068	42.6	35	1.4	1,068	42.6	1,437	57.4	60	2.4
Singapore ..	32,005	4,670	14.6	8,913	27.8	275	0.9	13,583	42.4	18,422	57.6	3,965	12.4
Total S.S. ...	195,561	8,179	4.2	55,013	28.1	2,812	1.4	63,192	32.3	132,369	67.7	36,330	18.6
F.M.S.—													
Perak ...	283,620	11,116	3.9	63,877	22.5	7,071	2.5	74,993	26.4	208,627	73.6	47,550	16.8
Selangor ...	315,395	5,721	1.8	62,484	19.8	6,814	2.2	68,205	21.6	247,190	78.4	52,196	16.5
Negri Sembilan ...	261,748	11,039	4.2	64,156	24.5	11,606	4.4	75,195	28.7	186,553	71.3	39,264	15.0
Pahang ...	85,301	3,858	4.5	21,960	25.8	5,216	6.1	25,818	30.3	59,483	69.7	9,415	11.0
Total F.M.S. ...	946,064	31,734	3.3	212,477	22.5	30,707	3.2	244,211	25.8	701,853	74.2	148,425	15.7
U.M.S.—													
Johore ...	477,953	16,942	3.5	133,158	27.9	35,268	7.4	150,100	31.4	327,853	68.6	60,845	12.7
Kedah ...	208,600	8,615	4.1	26,310	12.6	6,847	3.3	34,925	16.7	173,675	83.3	42,435	20.3
Kelantan ...	31,235	403	1.3	6,842	21.9	2,612	8.4	7,245	23.2	23,990	76.8	5,432	17.4
Trengganu (d) ...	4,817	nil	nil	42	0.9	nil	nil	42	0.9	4,775	99.1	2,301	47.8
Perlis (e) ...	1,459	335	23.0	271	18.5	147	10.1	606	41.5	853	58.5	224	15.4
Brunei ...	5,918	nil	nil	1,791	30.3	313	5.3	1,791	30.3	4,127	69.7	1,456	24.6
Total U.M.S. ...	729,982	26,295	3.6	168,414	23.1	45,187	6.2	194,709	26.7	535,273	73.3	112,693	15.4
Total MALAYA ...	1,871,607	66,208	3.5	435,904	23.3	78,706	4.2	502,112	26.8	1,369,495	73.2	297,448	15.9

Notes.—(*a*) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(*b*) The acreage shown in column (7) is included in columns (3) and (5).

(*c*) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF SEPTEMBER, 1939, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to Sept. 1939		during the month		January to Sept. 1939						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1939	during the month	Jan. to Sept. 1939	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1939
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	3,334	23,984	11,241	89,307	6,930	39,205	Nil	Nil	Nil	Nil	10,476	5,709	101,423	29,272	...	5,916	23,368	20	164
Johore ...	...	1,441	8,931	4,806	39,009	4,105	25,425	Nil	80	Nil	485	2,487	6,050	23,410	42,866	...	2,833	7,993	...	...
Kedah ...	...	204	5,435	2,923	22,408	924	6,449	Nil	Nil	Nil	Nil	1,468	2,615	13,465	16,023	...	490	4,913	...	...
Perlis ...	...	10	33	13	90	15	169	Nil	Nil	Nil	Nil	Nil	43	Nil	274	...	11	17	...	...
Kelantan ...	...	406	774	372	2,892	604	4,865	Nil	Nil	Nil	Nil	307	828	2,398	5,426	...	359	662	...	...
Trengganu ...	...	15	353	144	1,207	253	1,954	Nil	Nil	Nil	Nil	Nil	429	Nil	3,165	...	43	293	...	...
Brunei ...	...	8	82	52	351	47	497	...	...	...	...	...	117	...	876	...	Nil	72	...	...
Total Malay States	...	5,418	39,592	19,551	155,264	12,878	78,564	Nil	80	Nil	485	14,738	15,791	140,696	97,902	...	9,652	37,318	20	164
S. SETTLEMENTS :—																				
Malacca ...	...	1,363	2,111	1,034	8,444	681	4,486	Nil		Nil		2,063		18,824		...	1,619	1,886	...	...
Province Wellesley ...	...	903	954	458	3,363	202	1,426	Nil		Nil		6,197		53,238		...	1,084	974	...	...
Penang ...	947	2,096	21	18	146	91	601	2,818	13,474	22,723	94,089		Nil		Nil	2,137	2,071	13	...	...
Singapore ...	4,453	13,074	250	128	947	135	475	15,440		111,047		22,096		178,883		6,960	12,314	198	17	227
Labuan ...	...	13	Nil	Nil	Nil	2	77	44		452		Nil		Nil		...	11	Nil	...	...
Total Straits Settlements ...	5,400	17,449	3,336	1,638	12,900	1,111	7,065	18,302	13,474	134,222	94,089	30,356	Nil	250,945	Nil	9,097	17,099	3,071	17	227
Total Malaya ...	5,400	22,867	42,928	21,189	168,164	13,989	85,629	18,302	13,554	134,222	94,574	45,094	15,791	391,641	97,902	9,097	26,751	40,389	37	391

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	5,006	11,742	1,588	2,468	2,242	283
WET RUBBER	910	572	483	246	591	207
TOTAL ...	5,916	12,314	2,071	2,714	2,833	490

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Sept. 1939
29	30	31
Singapore ...	31,081	268,735
Penang ...	9,242	82,159
Port Swettenham.	4,642	39,803
Malacca ...	129	944
MALAYA ...	45,094	391,641

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Sept 1939
32	33	34
Malay States ...	30,436	237,998
Straits Settlements	2,564	19,757
MALAYA ...	33,53[illegible]	257,755

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] — [2] — [3] — [4] — [5] — [9] — [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 24th October, 1939

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1939.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.2	71.6	80.4	95	63	82	74	83.2	84.4	7.97	202.4	1.94	18	15	6	1	—	123.10	4.10	34
Bukit Jeram, Selangor† ...																				
Port Swettenham, Selangor	87.4	71.5	79.5	91	69	77	74	84.5	86.5	8.06	204.7	1.69	17	14	1	—	—	118.70	3.96	33
Sitiawan, Perak ...	87.9	72.7	80.3	91	71	82	74	83.9	85.3	5.08	129.0	0.85	18	14	1	—	—	131.75	4.39	36
Ipoh Aerodrome, Perak ...	89.2	72.4	80.8	93	70	80	75	83.1	84.4	8.88	225.6	1.40	19	18	5	—	1	134.85	4.49	37
Temerloh, Pahang ...	89.7	72.2	80.9	93	70	85	75	85.2	86.8	8.97	227.8	2.11	16	14	4	5	—	154.85	5.16	43
Kuala Lipis, Pahang ...	88.3	71.1	79.7	92	68	84	74	82.2	84.6	11.97	304.0	2.68	24	19	5	29	1	122.25	4.07	34
Kuala Pahang, Pahang ...	86.8	73.6	80.2	89	72	81	77	85.4	87.3	8.28	210.3	2.04	21	15	3	—	—	182.15	6.07	50
Kallang Aerodrome, S'pore ...	84.6	75.1	79.9	87	71	79	80	82.0	83.2	12.25	311.2	4.70	17	16	4	—	1	125.10	4.17	35
Bayan Lepas Aerodrome Penang ...	85.8	74.4	80.1	88	71	79	79	83.9	84.7	14.21	360.9	6.78	24	19	3	—	—	136.90	4.56	38
Malacca Town, Malacca ...	84.2	73.1	78.7	88	70	78	76	83.4	85.0	12.43	315.7	2.28	20	19	5	—	4	141.50	4.72	39
Kluang, Johore ...	87.5	71.3	79.4	94	69	81	73	81.4	82.4	8.83	224.3	2.27	20	16	6	7	—	108.55	3.62	30
Mersing, Johore ...	86.7	71.7	79.2	91	70	79	75	82.4	83.0	4.04	102.6	1.39	17	13	6	—	—	152.40	5.08	42
Alor Star, Kedah ...	86.3	73.4	79.9	91	71	75	75	83.9	85.3	11.94	303.3	3.16	21	17	—	—	—	151.90	5.06	42
Kota Bahru, Kelantan ...	89.5	72.9	81.2	94	70	87	75	84.5	85.6	7.43	188.7	2.30	14	12	2	—	—	183.00	6.10	49
Kuala Trengganu, Trengganu	88.4	72.5	80.5	91	70	86	75	84.0	86.4	5.19	131.8	1.36	17	14	10	—	—	174.65	5.82	48
Labuan ...	86.6	75.8	81.2	91	72	79	79	84.6	86.4	23.54	597.9	9.34	16	15	—	—	—	182.70	6.09	50
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	74.0	62.0	68.0	78	58	69	64	71.9	72.5	6.22	158.0	0.81	21	20	—	10	1	112.40	3.75	31
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.3	57.4	64.3	75	52	66	63	70.1	69.9	16.37	415.8	2.30	25	23	5	7	1	80.00	2.67	22
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.8	59.0	64.9	75	57	63	62	*	*	16.17	410.7	1.98	23	22	—	—	1	88.75	2.96	25

* Not recorded.

† Station closed on 15th August, 1939.